

What Is Claimed Is:

1 1. A method of reducing an aspect ratio of a trench,
2 comprising the steps of:
3 forming a trench in a substrate;
4 using HDP-CVD to form a conformal first oxide layer on a
5 surface of the trench;
6 forming a conformal first nitride layer on the first oxide
7 layer;
8 removing part of the first nitride layer to cause the first
9 nitride layer to be lower than a top surface of the
10 substrate; and
11 using a BOE solution to remove the first nitride layer and
12 part of the first oxide layer, thus forming a
13 remaining first oxide layer on the surface of the
14 trench at a lower portion.

1 2. The method according to claim 1, further comprising
2 at least one cycle of the steps of:
3 using HDP-CVD to form a conformal second oxide layer on the
4 remaining first oxide layer and the surface of the
5 trench;
6 forming a conformal second nitride layer on the second
7 oxide layer;
8 removing part of the second nitride layer to cause the
9 second nitride layer to be lower than a top surface
10 of the substrate; and
11 using a BOE solution to remove the second nitride layer and
12 part of the second oxide layer, thus forming a

13 remaining second oxide layer on the remaining first
14 oxide layer.

1 3. A method of reducing an aspect ratio of a trench,
2 comprising the steps of:

3 (a)providing a substrate;
4 (b)forming a trench in the substrate;
5 (c)using HDP-CVD to form a conformal first oxide layer on
6 a surface of the trench;
7 (d)forming a conformal first nitride layer on the first
8 oxide layer;
9 (e)forming a first photoresist layer in part of the trench
10 to cover part of the first nitride layer, wherein the
11 first photoresist layer is lower than a top surface
12 of the substrate;
13 (f)using the first photoresist layer as a mask, removing
14 part of the first nitride layer;
15 (g)removing the first photoresist layer; and
16 (h)using a BOE solution to remove the first nitride layer
17 and part of the first oxide layer, thus forming a
18 remaining first oxide layer on the surface of the
19 trench at a lower portion.

1 4. The method according to claim 3, further comprising
2 at least one cycle of the steps of:

3 (i)using HDP-CVD to form a conformal second oxide layer on
4 the remaining first oxide layer and the surface of
5 the trench;
6 (j)forming a conformal second nitride layer on the second
7 oxide layer;

8 (k) forming a second photoresist layer in part of the trench
9 to cover part of the second nitride layer, wherein
10 the second photoresist layer is lower than a top
11 surface of the substrate;
12 (l) using the second photoresist layer as a mask, removing
13 part of the second nitride layer;
14 (m) removing the second photoresist layer; and
15 (n) using the BOE solution to remove the second nitride
16 layer and part of the second oxide layer, thus forming
17 a remaining second oxide layer on the remaining first
18 oxide layer.

1 5. The method according to claim 3, wherein the first
2 photoresist layer is at least 1000Å lower than a top surface of
3 the substrate.

1 6. The method according to claim 4, wherein the second
2 photoresist layer is at least 1000Å lower than a top surface of
3 the substrate.

1 7. The method according to claim 3, wherein the formation
2 of the trench comprises the steps of:
3 forming a shield layer on part of the substrate; and
4 using the shield layer as a mask, etching part of the
5 substrate to define the trench therein.

1 8. The method according to claim 7, wherein the shield
2 layer comprises a pad oxide layer and a silicon nitride layer.

1 9. The method according to claim 3, further comprising,
2 prior to forming the first oxide layer, a step of:

3 forming a conformal linear layer on the surface of the
4 trench.

1 10. The method according to claim 3, wherein the first
2 oxide layer is a SiO_2 layer.

1 11. The method according to claim 3, wherein the nitride
2 layer is a Si_3N_4 layer formed by LP-CVD.

1 12. The method according to claim 3, wherein an etching
2 rate of the first oxide layer with the BOE solution is
3 $280\sim 320\text{\AA}/\text{min}$, and an etching rate of the first nitride layer with
4 the BOE solution is $8\sim 12\text{\AA}/\text{min}$.

1 13. The method according to claim 12, wherein a thickness
2 of the first oxide layer is $200\sim 300\text{\AA}$, and a thickness of the first
3 nitride layer is $40\sim 50\text{\AA}$.

1 14. A method of reducing an aspect ratio of a trench,
2 comprising the steps of:

3 (a)providing a silicon substrate;

4 (b)forming a trench in the silicon substrate

5 (c)using HDP-CVD to form a conformal first oxide layer on
6 a surface of the trench, wherein a thickness of the
7 first oxide layer is $200\sim 300\text{\AA}$;

8 (d)forming a conformal first nitride layer on the first
9 oxide layer, wherein a thickness of the first nitride
10 layer is $40\sim 50\text{\AA}$;

11 (e)forming a first photoresist layer in part of the trench
12 to cover part of the first nitride layer, wherein the

13 first photoresist layer is at least 1000Å lower than
14 a top surface of the substrate;
15 (f)using the first photoresist layer as a mask, removing
16 part of the first nitride layer;
17 (g)removing the first photoresist layer; and
18 (h)using a BOE solution to remove the first nitride layer
19 and part of the first oxide layer, thus forming a
20 remaining first oxide layer on the surface of the
21 trench at a lower portion, wherein an etching rate
22 of the first oxide layer with the BOE solution is
23 280~320Å/min, and an etching rate of the first
24 nitride layer with the BOE solution is 8~12Å/min.

1 15. The method according to claim 14, further comprising
2 at least one cycle of the steps of:
3 (i)using HDP-CVD to form a conformal second oxide layer on
4 the remaining first oxide layer and the surface of
5 the trench;
6 (j)forming a conformal second nitride layer on the second
7 oxide layer;
8 (k)forming a second photoresist layer in part of the trench
9 to cover part of the second nitride layer, wherein
10 the second photoresist layer is at least 1000Å lower
11 than a top surface of the substrate;
12 (l)using the second photoresist layer as a mask, removing
13 part of the second nitride layer;
14 (m)removing the second photoresist layer; and
15 (n)using the BOE solution to remove the second nitride
16 layer and part of the second oxide layer, thus forming

17 a remaining second oxide layer on the remaining first
18 oxide layer.

1 16. The method according to claim 14, wherein the
2 formation of the trench comprises the steps of:
3 forming a shield layer on part of the silicon substrate;
4 and
5 using the shield layer as a mask, etching part of the
6 silicon substrate to define the trench therein.

1 17. The method according to claim 16, wherein the shield
2 layer comprises a pad oxide layer and a silicon nitride layer.

1 18. The method according to claim 14, further comprising,
2 prior to forming the first oxide layer, a step of:
3 forming a conformal linear layer on the surface of the
4 trench.

1 19. The method according to claim 14, wherein the first
2 oxide layer is a SiO₂ layer.

1 20. The method according to claim 14, wherein the nitride
2 layer is a Si₃N₄ layer formed by LP-CVD.